

3. SAMPLING OBJECTIVES FOR DEFINING THE AREA OF CONTAMINATION IN AND AROUND THE V-TANK SITES

The Intermediate-Level Radioactive Waste (ILRW) Feed Subsystem (TSF-09/18 and TSF-21) includes the collecting tanks (V-1, V-2, and V-3), the sump tank (V-9), a sand filter, a total of fourteen individual pipes that connected the tanks to TAN-616, and the surrounding contaminated soils (hereafter referred to as the V-Tank sites). For FY 2003, isolation of the sump tank (V-9) by capping the tank inlet lines and cutting and capping the tank outlet line, removal of the disconnected V-9 tank outlet piping, and determination of the area of contamination associated with the V-Tank site soils have been scheduled for ERA in support of RD/RA and closure activities that are to be conducted in the future.

3.1 Data Needs

Data needs have been determined through the evaluation of existing data and the projection of anticipated data requirements. The overall objective of Section 3 in this Field Sampling Plan is to define the area of contamination (AOC) (nature and extent) in and around the V-Tank sites. This includes:

- Defining and attempting to minimize the three-dimensional footprint of the V-Tank sites
- Developing vertical and horizontal contamination profiles for potential variations in waste management requirements
- Characterizing the soils to ensure that they meet the waste acceptance criteria for subsequent waste dispositioning at the intended disposal facility.

In support of these activities, samples will be collected under varying conditions involving various media and subsequent analysis. The data gathered from the characterization efforts and the resultant remedial actions prescribed by these characterization efforts will be used to establish remedial action objectives (RAOs) for contaminants other than Cs-137 at the V-Tank sites. These RAOs will be compared to the confirmatory analytical data, when available, to ensure that the total risk posed by these contaminants is less than $1E-04$.

To ensure data collected are of sufficient quality to meet both RCRA and CERCLA requirements, the DQO process has been used for these sampling activities, and is described in Section 3.2. As qualitative and quantitative statements, the DQOs help to ensure that collected data are of sufficient quality and quantity to achieve the objectives established in this FSP.

The criteria for measurement data are expressed as quality assurance objectives (QAOs). The measurement QAOs are specifications that data must meet to comply with the project needs specified by the DQOs. The specific QA parameters of interest are defined as quantitative QA parameters (precision, accuracy, method detection limit [MDL], and completeness) and qualitative parameters (representativeness and comparability). The QAOs are described in Section 3.3.

This FSP is used in conjunction with the QAPjP (DOE-ID 2002a) to present the functional activities, organization, and QA/QC protocols necessary to achieve the specified DQOs. Together, the QAPjP and the FSP constitute the SAP for OU 1-10 V-Tank confirmation soil sampling activities.

3.2 Data Quality Objectives

In order to ensure that the data for this project are of sufficient quality and quantity to support defensible decisions, the process of collecting and analyzing data must be scientifically defensible. The sampling process is discussed in the context of DQOs, as defined by Guidance for the Data Quality Objectives Process (EPA 1994). The concept of DQOs was developed by the EPA to establish a process for defining the data needed to make defensible decisions involving the study, design, and cleanup of hazardous waste sites and to ensure that the type, quantity, and quality of data used in the decision-making are appropriate for the intended application. The goals of the DQO process are technical adequacy (technically sound deliverables), defensibility, consistency in approach and documentation, and cost effectiveness.

The DQO process includes seven steps. The seven-step DQO process is a highly structured, tactical approach to implementing the overall DQO process, and each of the seven steps has a specific output. The output from each step influences the choices that will be made later in the process. In order for the seven-step DQO process to be effective, steps must be performed in the proper order, inputs must be based on comprehensive scoping and maximum participation/contributions by decision makers, and sample design must be based on the severity of the consequences of decision error. Even though the DQO process is depicted as a linear sequence of steps, in practice it is iterative (i.e., the outputs from one step may lead to a reconsideration of prior steps). This iteration is encouraged since it will ultimately lead to a more efficient data collection design.

3.2.1 Problem Statement

The first step in the DQO process is to clearly and concisely state the problem to be addressed at the V-Tank sites (TSF-09/18 and TSF-21). The concise problem statement describes the problem as it is currently understood, and the conditions that are causing the problem. Prior studies and existing information are reviewed to gain a sufficient understanding to define the problem. The appropriate outputs for this step are a concise description of the problem, a list of the planning team members, identification of the decision-maker(s), and a summary of available resources and relevant deadlines for the study. The planning team members and decision-makers are identified in Section 1. The ERAs are scheduled for the summer of 2003.

The V-Tank sites (TSF-09/18 and TSF-21) were installed in the early 1950s as part of a system designed to collect and treat radioactive liquid effluents from TAN operations. The tank contents are contaminated with radionuclides, heavy metals, organic compounds, and polychlorinated biphenyls (PCBs). As a result of operations at the V-Tank area, the soil is contaminated by numerous spills when waste was transferred to and from the tanks. Since releases at these sites may pose an imminent and substantial endangerment to human health and the environment, the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999) determined that the selected remedy for the V-Tanks is soil and tank removal, ex situ treatment of tank contents, and disposal, which will address the principal threat posed by the V-Tank contents. In addition, to complete closure of the V-Tanks under RCRA, the tank system performance standard requires removal or decontamination of contaminated soils.

Given this information, the problem statements are as follows:

1. It is necessary to define the area of contamination associated with the V-Tank sites and associated piping and valve pits. Since data available to define the area of contamination are inadequate, sufficient samples are required to accurately and comprehensively define the area of contamination.

2. Contaminated soils must be containerized and shipped to an appropriate disposal facility. Since waste profile information must be provided to the intended disposal facility, sufficient samples of the contaminated soil are required to generate the waste profile. In addition, the contaminated soils must be characterized to ensure that they meet the waste acceptance criteria for subsequent waste dispositioning at the intended disposal facility.

3.2.2 Identification of Decisions

The primary objective of Step 2 in the DQO process is to develop accurate and comprehensive decision statements (DSs) that address the concerns highlighted in the problem statement. This includes identifying the questions that the study will attempt to resolve, and what actions may result or be affected by the data collected. This is done by specifying principle study questions (PSQs), identifying alternative actions (AAs) that could result from resolution of the PSQs, and combining the PSQs and AAs into DSs.

The two PSQs pertaining to the first problem statement are:

- PSQ1: Has the area of contamination associated with the V-Tanks been bounded with respect to Cs-137 contamination?
- PSQ2: Is Cs-137 representative of the contaminants within the area of contamination?
- The AAs to be taken, depending on the resolution to PSQ1, are as follows:
 - AA1a: If the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination, then no further sampling and analysis is required to define the area of contamination, and the Cs-137 data will be used to delineate the three-dimensional footprint of the V-Tank sites.
 - AA1b: If the area of contamination associated with the V-Tanks has not been bounded with respect to Cs-137 contamination, then soil samples will be collected and analyzed for Cs-137, in accordance with Section 4, to delineate the three dimensional footprint of the V-Tank sites.
- The AAs to be taken, depending on the resolution to PSQ2, are as follows:
 - AA2a: If Cs-137 is representative of the contaminants within the area of contamination, then soil samples will be collected and analyzed only for Cs-137, in accordance with Section 4, to delineate the three dimensional footprint of the V-Tank sites.
 - AA2b: If Cs-137 is not representative of the contaminants within the area of contamination, then additional soil sampling and analysis will be required for additional contaminants of potential concern to delineate the three dimensional footprint of the V-Tank sites.
- Combining PSQ1 and AA1 results in the following DS:
 - DS1: Determine if the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination for delineation of the three-dimensional footprint of the V-Tank sites.

Combining PSQ2 and AA2 results in the following DS:

- DS2: Determine if Cs-137 is representative of the contaminants within the area of contamination.

The two PSQs pertaining to the second problem statement are:

- PSQ3: Is sufficient information available for the contaminated soils to provide waste profile information to the intended disposal facility?
- PSQ4: Do contaminated soils in the area to be remediated at the V-Tank sites meet waste acceptance criteria for the intended disposal facility?

The AAs to be taken, depending on the resolution to PSQ3, are as follows:

- AA3a: If sufficient information is available to provide waste profile information to the intended disposal facility, then the waste profile will be completed and no further samples will be collected for waste profiling when the soil is excavated in 2006.
- AA3b: If sufficient information is not available to provide waste profile information to the intended disposal facility, then additional samples will need to be collected to complete the waste profile.

The AAs to be taken, depending on the resolution to PSQ4, are as follows:

- AA4a: If contaminated soils in the area to be remediated at the V-Tank sites meet waste acceptance criteria for the intended disposal facility, then the contaminated soils will be transported to the intended disposal facility after it is excavated in 2006.
- AA4b: If contaminated soils in the area to be remediated at to the V-Tank sites do not meet waste acceptance criteria for the intended disposal facility, then alternative treatment/disposal options will be investigated.

Combining PSQ3 and AA3 results in the following DS:

- DS3: Determine whether sufficient information is available to provide waste profile information to the intended disposal facility or the alternate treatment/disposal facility.

Combining PSQ4 and AA4 results in the following DS:

- DS4: Determine whether contaminated soils in the area to be remediated at the V-Tank sites meet the waste acceptance criteria for the intended disposal facility or the alternate treatment/disposal facility.

3.2.3 Identification of Inputs to Decisions

Decision inputs are the parameters required to resolve the DSs and determine which decisions require environmental measurements. The information needed to resolve the DSs listed above is a compilation of all historical documents related to the V-Tank sites to determine if the area of contamination can be defined and waste profile documentation can be completed using the existing data. During this step of the DQO process, the basis for an action level is established. The action level is the threshold value that provides the criterion for choosing between AAs. Action levels may be based on regulatory thresholds or standards, or they may be derived from problem-specific considerations such as risk analysis. If the AA is for waste profiling purposes, then the action levels will be based on regulatory thresholds or standards. If the AA is for CERCLA remediation purposes, then the action levels will be based on a risk analysis.

To resolve DS1, the data in all V-Tank-related documentation was reviewed to determine if the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination for delineation of the three-dimensional footprint of the V-Tank sites. Using the V-Tank-related documentation, a soils sampling and analysis design was created, as shown in Section 4. It was determined that previously collected information is insufficient to accurately bind the area of contamination with respect to Cs-137. The vertical extent of contamination is particularly problematic. Radiological characterization of the soils will be carried out with the sampling design described in Section 4. The samples will be analyzed onsite to determine where soils with concentrations of Cs-137 in excess of the FRG (23.3 pCi/g) are located. Following sampling and analysis, a three-dimensional map will be created, delineating the three-dimensional footprint of the V-Tank sites with regard to Cs-137.

To resolve DS2, samples will be collected using the sampling design described in Section 4. For samples collected from locations at which Cs-137 is identified, other potential contaminants of concern should also be identified. For samples collected from locations at which Cs-137 is not detected, other potential contaminants of concern should also not be detected. Therefore, if Cs-137 is representative of the contamination within the area of contamination, the presence or absence of Cs-137 will also be indicative of the presence or absence of other potential contaminants of concern. This conclusion is based on previous sampling in the V-Tank area. In the event that sample results indicate areas of hazardous waste contamination without also being radiologically contaminated, additional sampling may be required and additional contaminants of concern identified.

To resolve DS3 and DS4, the data in all V-Tank-related documentation were reviewed to determine whether enough historical data had been collected from surface and subsurface soils surrounding the V-Tank sites to provide waste profile information to the intended disposal facility. It was determined that previously collected information is insufficient to complete a waste profile of the V-Tank soils, so additional samples will be collected using the sampling design described in Section 4 to use to complete waste profiling of the contaminated soils and to ensure that the facility's waste acceptance criteria have been addressed.

A summary of the data needs and uses relative to the problem and decision statements is given in Table 3-1. Sampling may be broken into three sectors: Zone A is the area defined as the AOC and is the area in the immediate vicinity of the tanks; Zone B is an area where contamination resulting from migration through soil may be present or where spills or leaks in piping or valve pits may have occurred; and Zone C, to the north of the tanks, is an area of possible contamination resulting from windblown soil dispersion (see Figure 4-1). Statistically sound sampling regimes and associated analysis suites shall be established for each sector. This campaign shall provide for adequate characterizing of soils upon which to base soil removal actions and subsequent waste disposition.

3.2.4 Definition of Study Boundaries

During Step 4, the spatial and temporal boundaries to which decisions will apply in order to clarify the sample domain are defined. The spatial boundaries simply define the physical extent of the study area and may be subdivided into specific areas of interest. The temporal boundaries define the duration of the study or specific parts of the study. The outputs of this step are a detailed description of the spatial and temporal boundaries of the problem and a discussion of any practical constraints that may interfere with the study.

For the V-Tank sites, the spatial boundaries include all of the contaminated soils surrounding the V-Tanks, which may include soils to the north of the V-tanks that may have been contaminated by windblown contaminants. The V-Tank area is shown in Figure 4-1. The area of contamination will be defined with respect to Cs-137 contamination by employing the sampling and analysis design in

Table 3-1. V-Tank sites data uses summary.

Objective	Decision Statement	Data Use
Characterize the Area of Contamination:		
Define and minimize the three-dimensional footprint of the V-Tank sites and develop vertical and horizontal contamination profiles for potential variations in waste management requirements.	Determine if the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination.	Estimate the soil volumes to be remediated in 2006.
	Determine if Cs-137 is representative of the contaminants within the area of contamination.	Verify a relationship between Cs-137 and other contaminants potentially present at the V-Tank sites.
		Establish remedial action objectives (RAOs) for the V-Tank sites.
Soils must be characterized so contaminated soils can be containerized and shipped to an appropriate disposal facility.	Determine whether sufficient information is available to provide waste profile information to the intended disposal facility.	Support hazardous waste determinations for disposal of soils at the intended disposal facility.
		Provide waste profile information to the intended disposal facility
	Determine whether contaminated soils in the area to be remediated at the V-Tank sites meet waste acceptance criteria for the intended disposal facility	Ensure the contaminated soils meet the waste acceptance criteria for the intended disposal facility.

Section 4. The samples will be analyzed onsite to determine where soils with concentrations of Cs-137 in excess of the FRG (23.3 pCi/g) are located. Following sampling and analysis, a three-dimensional map will be created, delineating the three-dimensional footprint of the V-Tank sites with regard to Cs-137 and developing vertical and horizontal contamination profiles for potential variations in waste management requirements.

During activities to be conducted in 2005 and 2006, soil will be excavated based on the area of contamination defined in the three-dimensional map. Following excavation of the soil, the soil and the containers into which the soil is incorporated will be included in the spatial boundaries.

3.2.5 Development of Decision Rules

Step 5 combines Steps 1 through 4 to produce four elements to form decision rules: the statistical parameter of interest; scale of decision-making; action level; and AAs. It integrates the previous DQO outputs into a single statement that describes the logical basis for choosing among AAs.

The decision rule is an “if . . . then . . .” statement, describing the action to take if one or more conditions are met that combines the parameter of interest, the scale of decision-making, the action level, and the action(s) that would result from resolution of the decision.

For the V-Tank sites, the population of interest has been defined as all of the contaminated soils surrounding the V-Tanks and TSF-21 (to include soils beneath these structures), and the shallow ditch as shown in Figure 4-1. The statistical parameter of interest for this material will be the RAOs established as a result of sampling activities conducted in Section 4. The potential contaminants of concern for this site are the constituents identified in the liquid and sludge within the V-Tanks.

The decision rules relevant to defining the area of contamination associated with the V-Tanks are:

- **If** the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination, **then** no further sampling and analysis is required to define the area of contamination. The Cs-137 data will be used to create a three-dimensional map, illustrating all of the information previously collected and delineating the three-dimensional footprint of the V-Tank sites.
- **If** the area of contamination associated with the V-Tanks has not been bounded with respect to Cs-137 contamination, **then** soil samples will be collected and analyzed for Cs-137, as described in Section 4, to delineate the three dimensional footprint of the V-Tank sites. Then, the decision rules become:
 - **If** Cs-137 is detected at concentrations above the remedial action objective, **then** those areas will be defined as part of the area to be remediated.
 - **If** Cs-137 is detected at concentrations below the remedial action objective, **then** those areas will not be included as part of the area to be remediated.
- **If** Cs-137 is representative of the contaminants within the area of contamination, **then** soil samples will be collected and analyzed only for Cs-137, in accordance with Section 4, to delineate the three dimensional footprint of the V-Tank sites.
- **If** Cs-137 is not representative of the contaminants within the area of contamination, **then** additional soil sampling and analysis will be required for additional contaminants of potential concern to delineate the three dimensional footprint of the V-Tank sites.

The decision rules relevant to providing waste profile information are:

- **If** enough data have been collected from surface and subsurface soils surrounding the V-Tank sites to provide waste profile information to the intended disposal facility, **then** the waste profile will be completed and no further samples will be collected for waste profiling when the soil is excavated in 2006.
- **If** it is determined that data collected are insufficient to complete a waste profile of the V-Tank soils, **then** additional samples will be collected to complete the waste profile.
- **If** the estimated 90% upper confidence limit (UCL) for the contaminant concentration of any COC calculated from data collected during the field sampling events described by this FSP does not exceed the waste acceptance criterion for that COC, **then** the waste will be sent to the intended disposal facility.

- If the estimated 90% UCL for the contaminant concentration of any COC calculated from data collected during the field sampling events described by this FSP exceeds the waste acceptance criterion for that COC, **then** the waste cannot be sent to the disposal facility. The amount exceeded will be evaluated by the facility or alternative treatment/disposal options will be investigated.

3.2.6 Specification of Limits on Decision Errors

Since analytical data can only provide an estimate of the true condition of a site, decisions that are based on such data potentially could be in error. The purpose of Step 6 is to minimize uncertainty in the data by defining tolerable limits on decision errors that are used to establish performance goals for the data collection design.

The decision-maker must define acceptable limits on the probability of making a decision error. The possibility of decision error cannot be eliminated, but it can be minimized by controlling the total study error. Methods for controlling total study error include collecting a sufficient number of samples (to control sampling design error), analyzing individual samples several times, or using more precise analytical methods (to control measurement error). Therefore, it is necessary to determine the possible range for the parameter of interest and to define both the types of decision errors and the potential consequences of the errors.

Defining the AOC could result in the following decision errors:

- Concluding that the area of contamination associated with the V-Tanks has been bounded with respect to Cs-137 contamination (when in fact it has not) would result in improperly defining the area to be remediated and potentially put workers at risk. Concluding that area of contamination associated with the V-Tanks has not been bounded with respect to Cs-137 contamination (when in fact it has) would unnecessarily increase the project costs and could result in the following decision error:
 - Concluding that the soils in a particular area do not contain Cs-137 at concentrations above the RAO (when in fact they do) would result in improperly defining the area to be remediated. Subsequently, the entire area of contaminated soil would not be excavated, creating CERCLA compliance issues and potentially putting workers at risk. Concluding that the soils in a particular area contain Cs-137 at concentrations above the RAO (when in fact they do not) would unnecessarily increase the cost of disposal.
- Concluding that Cs-137 is representative of the contaminants within the area of contamination (when in fact it is not) would result in improperly defining the area to be remediated. Concluding that Cs-137 is not representative of the contaminants within the area of contamination (when in fact it is) would result in increasing project costs based on an increased number of samples and analyses.

Determining whether enough data have been collected to complete a waste profile could result in the following decision errors:

- Concluding that enough data have been collected from surface and subsurface soils surrounding the V-Tank sites to provide waste profile information to the intended disposal facility (when in fact it has not) would result in an incomplete waste profile. This may necessitate having to go back to the site to recollect waste profile information, increasing project costs. Concluding that the data collected are insufficient to complete a waste profile of the V-Tank soils (when in fact they are

sufficient) would result in collecting additional unnecessary samples and would unnecessarily increase the project costs.

- Concluding that the estimated 90% UCL contaminant concentration of any COC calculated from data collected during the field sampling events described by this FSP does not exceed the waste acceptance criterion for that COC (when in fact it does) would result in improper disposal of the soil and would create CERCLA compliance issues. Concluding that the estimated 90% UCL contaminant concentration of any COC calculated from data collected during the field sampling events described by this FSP exceeds the waste acceptance criterion for that COC (when in fact it does not) would unnecessarily increase project costs by requiring alternate treatment/disposal options.

Because biased sampling and a systematic sampling strategy will be conducted at this site, statistically based decision error limits (Type 1 and Type 2) are not appropriate. Instead, for the biased sampling, uncertainty will be reduced by using instrumentation to determine areas of highest contamination, and these locations will be sampled. The sampling design is discussed further in Section 4.

3.2.7 Optimization of Investigation Design for Obtaining Data

The purpose of design optimization in the DQO process is to evaluate information from the previous steps, generate alternative data collection design options that will provide the data needed for the desired analysis, and select the most resource-effective design that meets all DQOs. The activities involved in design optimization include:

- Reviewing the outputs of the first six steps and existing environmental data
- Developing general data collection design alternatives
- Formulating a mathematical expression needed to solve the design problem for each data collection design alternative
- Selecting the optimal number of samples to satisfy the DQOs for each data collection design alternative
- Selecting the most resource-effective data collection design that satisfies all the DQOs.

After these activities are completed, the operational details and theoretical assumptions of the selected design are documented in the FSP. Several designs were considered during the development of this plan. The details proposed in Section 4 are the designs projected to meet project resource availability while satisfying the DQOs.

3.3 Quality Assurance Objective for Measurement

The QA objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2002a), which provides minimum requirements for the following measurement quality indicators:

- Precision
- Accuracy

- Representativeness
- Completeness
- Comparability.

Precision, accuracy, and completeness will be calculated in accordance with the QAPjP. Representativeness and comparability will be promoted by the sampling design, the collection of samples using similar sampling techniques to previous efforts, and the use of the same analytical techniques as previous efforts. By promoting representativeness and comparability in this manner, the previous data set can be supplemented with the new data collected under implementation of this FSP.

Spatial variations are present in concentrations of contaminants at a site, creating sampling variability. Additional variability occurs during sample collection, handling, processing, analysis, quality evaluation, and reporting. While the variability associated with sampling cannot be eliminated, it can be minimized by using the DQOs, as given in Section 3.2, and obtaining QA samples, such as duplicate samples, field blanks, and rinsate samples. To ensure that data collected are sufficiently accurate and consistent with the DQOs, the following parameters will be used for assessing the quality of the measurement data.

3.3.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. It is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, and expressed generally in terms of standard deviation. In the field, precision is affected by the natural heterogeneity of the material being sampled and by sample collection procedures.

Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision is typically required for chemicals with very low action levels that are close to background concentrations.

Sampling for this section of the FSP will be performed prior to excavation and removal of the V-Tanks in order to help characterize and profile the soils surrounding the tanks. Sampling will include field sampling, field analysis, and laboratory analysis.

Laboratory precision requirements are part of the validation criteria against which laboratory data are evaluated. Laboratory precision is estimated through the use of duplicates, spiked samples (i.e., matrix and/or surrogate spikes), and/or laboratory control samples (LCSs). Laboratory precision will be evaluated during the method data validation process. The number of laboratory QC samples is specified in the analytical methods used and in the SAM SOW (or task order SOWs). Evaluation criteria for the QC samples are specified in the SAM data validation technical procedures (TPRs).

Field precision will be based upon analysis of co-located field duplicate or split samples. For samples collected for laboratory analyses, a field duplicate will be collected at a minimum frequency of one for every 10 field samples. Based on the collection of approximately 67 samples to define the nature and extent of contamination at the V-Tank sites, seven duplicate samples will be collected, assigned a separate sample number, and submitted blind to the laboratory. Duplicate samples will be collected in accordance with Section 4.1 of this FSP. Duplicate sample locations are indicated in the SAP tables in Appendix A.

3.3.2 Accuracy

Accuracy is a measure of bias in a measurement system. It is the closeness of agreement between the measured value and the true value and is calculated as %R. Sample preservation and handling, field contamination, and the sample matrix in the field affect overall accuracy. The effects of these three parameters can be assessed by evaluating the results of field blanks and equipment rinsates (i.e., equipment blanks). Field blanks are collected and analyzed to determine the level of contamination, if any, introduced into the sample during field sampling activities. They consist of the same water used for equipment decontamination. A rinsate is a sample of analyte-free water poured over decontaminated sampling equipment and is designed to detect any residual contamination on the equipment.

Laboratory accuracy requirements are part of the validation criteria against which laboratory data are evaluated. Laboratory accuracy is assessed through the use of matrix spikes, laboratory control samples, and blind QC samples, and will be evaluated during the method data validation process. The number of laboratory QC samples is specified in the analytical methods used and in the SAM SOW (or task order SOW). Evaluation criteria for the laboratory QC samples are specified in the SAM data validation TPRs.

Field accuracy will be determined for samples collected for laboratory analysis. The requirement for collecting field and equipment blank samples is a frequency of one for every 10 environmental samples or a minimum of one each day, whichever is less. In addition, the requirement for equipment rinsate samples states that equipment rinsates will be collected whenever there is a change in the sample collection procedures, sample decontamination procedures, sampling equipment, or sample collection personnel. Duplicate samples will be collected in accordance with Section 4.1 of this FSP. Duplicate sample locations are indicated in the SAP tables in Appendix A. The equipment rinsate samples will be collected (at a minimum) at the initiation of sampling at the V-Tank sites and at the conclusion of sampling at the V-Tank sites. The number of field and equipment blank samples is subject to change based on the field conditions and sampling efficiency.

3.3.3 Representativeness

The objective of representativeness is to assess whether information obtained during the investigation accurately represents actual site conditions. Representativeness is a qualitative parameter that expresses the degree to which the sampling and analytical data accurately and precisely reflect the characteristic of a population, the parameter variations at a sampling point, or an environmental condition (EPA 1987). Representativeness addresses the proper design of the sampling program implemented by the FSP. This criterion is satisfied by confirming that sampling locations are selected properly, a sufficient number of samples are collected, and an appropriate sampling technique is employed to meet the confidence level required by the intended use of the data. Variations at a sampling point will be evaluated based on the results of field duplicates.

For the purposes of the V-Tank sites sampling, good representativeness will be achieved through careful, informed selection of sampling sites and analytical parameters, through collection of a sufficient number of samples to assess the confidence level of the data with respect to its intended use, and through the proper collection and handling of samples to avoid interferences and to minimize contamination and loss. Section 3.2 of the FSP describes the DQOs used to select sample locations and number of samples.

3.3.4 Completeness

Completeness is a measure of the quantity of valid data collected during an investigation compared to the amount expected to be obtained under correct, normal conditions. It is a quantitative evaluation of

what percent of the chemical measurements meet the project DQOs. The QAPjP (DOE-ID 2002a) requires that an overall completeness goal of 90% be achieved during a RI/FS. For all samples required for this FSP, a completeness goal of 90% is specified.

Successful analyses are defined as those where the samples arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and accompanied by a completed chain of custody. Furthermore, the sample must be analyzed within the specified holding time and in such a manner that analytical QA/QC described in this document is met.

Completeness for the entire project also involves completeness of field and laboratory documentation, whether all samples and analyses specified in this FSP have been processed, and the procedures specified in the FSP have been implemented.

3.3.5 Comparability

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. It defines the extent to which a chemical parameter measurement is consistent with, and may be compared to, values from other sampling events. At a minimum, comparable data must be obtained using unbiased sample designs. If sampling designs are not unbiased, the reasons for selecting another design should be well documented. For this project, the rationale for the sampling design is presented in Section 4.

Comparability among field measurements will be achieved through the use of standard procedures, standard field data sheets, and uniform concentration units. To ensure comparability, field procedures will be standardized and field operations will adhere to MCPs and TPRs. Laboratory data comparability will be ensured by the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), and consistency in reporting units. Analysis of standard reference materials will follow EPA or other standard analytical methods, which utilize standard units of measurement, methods of analysis, and reporting format.

Although no data have previously been collected from soil beneath the V-Tanks, data have been collected from areas in the immediate vicinity of the V-Tanks. The data collected under this sampling plan will primarily be biased towards areas of known or suspected contamination. Therefore, it is unlikely that the data collected during the ERA will provide analytical results that can be compared to the historical data sets.

3.3.6 Sensitivity

Ensuring the validity of quantitative measurements at low concentrations is an extremely difficult technical problem. With regulatory action levels being pushed lower and lower, the validity of any given measurement becomes even more important. The consequences of false positive or false negative data can be significant. The laboratory will report results below the reporting limit as “Not Detected” because, by definition, the reliability of the data at that level is questionable. Organic data that need to be reported below the quantitation limit will have the data flagged accordingly.

Quantitation limits are the extent to which the equipment, laboratory or field, or analytical process can provide accurate, minimum data measurements of a reliable quality for specific constituents in replicate field samples. It is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The actual quantitation limit for a given analysis will vary depending on instrument sensitivity and matrix effects.

If dilution is required to bring the reported concentration of a single compound of interest within the linear range of the calibration, and the dilution results in nondetect values for all other analytes with detected concentrations in the initial sample analysis, the results of the original run and the dilution will be reported with appropriate notations in the narrative of the report. Matrix effects (i.e., highly contaminated samples requiring dilution for analysis, dilution to bring detected levels within the range of calibration, and matrix interference requiring elevation of detection limits) will be considered in assessing compliance with the requirements for sensitivity.

Several detection levels are utilized in environmental laboratories, such as method detection limits (MDLs), instrument detection levels (IDLs), practical quantitation limits (PQL), and contract-required quantitation limit (CRQL). Generally, the detection level is the smallest amount that can be detected above the instrument noise in a procedure and within a stated confidence level.

The MDL is an empirically derived value used to estimate the lowest concentration a method can detect in a matrix-free environment. SW-846 defines the MDL as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL is determined from the analysis of replicate samples of a given matrix, containing analytes, which have been processed through the preparation or extraction procedure. The guidance in 40 CFR 136 Appendix B is used to produce MDLs. Method detection limits are updated by the laboratory annually, at a minimum, and after significant instrument maintenance.

The PQL is the lowest concentration that can be reliably achieved within limits of precision and accuracy during routine operating conditions. The PQLs for reagent water are generally 3 to 5 times the MDL, but may be less or more based on the performance of the method for a particular analyte. Sample PQLs are highly matrix dependent. The PQLs provided in SW-846 are for guidance and may not always be achievable.

The CRQL is the PQL after review and approval by regulators (i.e., when the PQL becomes part of a contract).

Method blanks are reported to the MDL and samples are reported to the PQL.

3.4 Data Validation

Data validation is the process of data assessment in accordance with EPA regional or national functional guidelines or project-specific guidelines.

Accurate data reduction, validation, and reporting protocols are necessary to interpret data and arrive at decisions. The quality of the data collection process will be assessed through reviews of all measurements performed. The purpose of this section is to discuss the evaluation and assessment of QA/QC requirements necessary to document the quality of the collected data. The frequency of data review validation and verification is discussed below according to the category of data collected.

Data will be acquired, processed, and controlled prior to input to Integrated Environment Data Management System (IEDMS) under PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment." For samples submitted to the analytical laboratory, the SAM will validate the data to the appropriate levels of analytical method data validation (Level B) in accordance with the appropriate TPRs and the QAPjP (DOE-ID 2002a). Validated data are entered into the IEDMS and uploaded to the Environmental Restoration Information System (ERIS).

4. SAMPLING LOCATION AND FREQUENCY

This section presents the required sample locations and frequency to support the objectives outlined in Section 3. These objectives include collecting samples to define the AOC related to the V-Tank sites, providing data that will be used to generate waste profiles, and characterizing V-Tank site soils to ensure that they meet the waste acceptance criteria for the intended disposal facility.

All underground utilities will have been located (an effort conducted under a separate work plan) and excavation permits obtained prior to any intrusive soil sampling operations.

4.1 Sampling Locations

The following sections describe the intended sampling locations, including the rationale for location selection and the analytical methods necessary to meet the data needs discussed in Section 3.1.

The V-Tank site and the area immediately surrounding the V-Tanks have been divided into three zones. Zone A is the area defined as the AOC and is the area in the immediate vicinity of the tanks. Zone B is an area where contamination resulting from migration through soil may be present or where spills or leaks in piping or valve pits may have occurred. Zone C, to the north of the tanks, is an area of possible contamination resulting from windblown soil dispersion (Figure 4-1).

For the V-Tank sites sampling will be carried out in two phases. Phase I is a preliminary investigative effort that will be accomplished prior to subsurface soil sampling activities. Phase II will consist of down-hole gamma analyses and collecting soil samples for field laboratory analyses.

4.1.1 Phase I Sampling Locations

The Phase I investigation will occur over the entire area shown in Figure 4-1. Phase I sampling will consist of a surface scan for gamma radiation using a tripod-mounted lead collimated detector. Drive-over scans using HumVee-mounted scintillators may also be used to quickly identify potential hotspots, thereby narrowing the field of surface scanning for the tripod-mounted detector. The detector will be set up at various locations within the area in such a manner that the entire area will be scanned for surface and near-surface gamma activity. Results of the scan may be used to determine the locations of surface and subsurface soil sampling and quantification of Cs-137.

4.1.2 Phase II Sampling Locations

Phase II sampling will consist of down-hole gamma analyses in each boring or—if required because of background interference—of collecting soil samples to be field-analyzed for Cs-137. Based on the results obtained during the Cs-137 field analyses, soil samples will be collected to send to the laboratory for analyses for metals, VOCs, SVOCs, PCBs, herbicides, pesticides, and radionuclides. Proposed Phase II sampling locations are shown in Figure 4-1. A geophysical survey will be conducted for suspected or known underground obstructions, and the results will be taken into account when field-locating soil borings.

General Notes

1. This drawing was generated using Drawing PVD-NEV-TAN-008-6168. Courtesy of Portage, Inc. overlaid onto the TAN Planometric Data (State Plane East NAD83).
2. This drawing may not depict all the underground utilities and piping, therefore the sampling locations will have to be field verified in order to avoid them. Then the drawing should be revised for any new locations. Also, the accuracy of the planometric data may not show the exact location of the facilities.
3. Boreholes will be abandoned by backfilling with cuttings and/or bentonite.
4. Phase II sampling will be based on a dynamic workplan approach. If it is determined that the soil borings already completed in a given area have provided sufficient data, then other planned borings in that area may be eliminated or moved to a location where the boring might be expected to provide better information.

LEGEND

SS - SHALLOW SOIL BOREHOLE
DS - DEEP SOIL BOREHOLE
--- ZONES

No.	Description/Name	Date

Client: North Wind, Inc.

Project Name and Address: Field Sampling Plan for Early Remediation Activities

Revision: 4-1

Drawn by: V-Tank FSP

Date: 02/12/2003

Scale: 1" = 40'

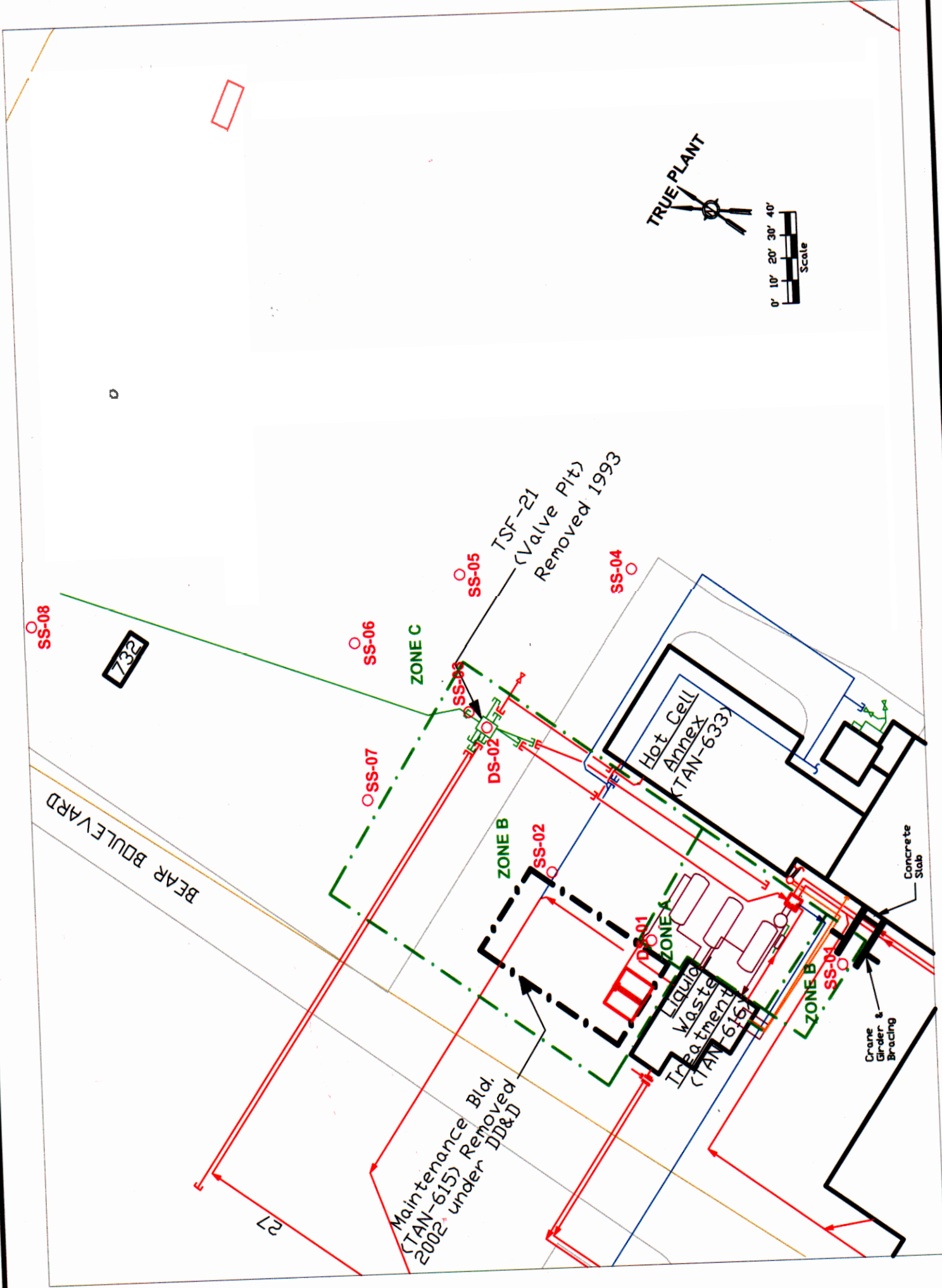


Figure 4-1. Soil Boring and Sampling Locations in the V-Tank Area.

Phase II sampling will be based on a dynamic work plan approach. In a static work plan, samples are collected in predetermined locations without consideration for knowledge gained from field sampling results. A dynamic work plan allows the SAP to adapt as information is obtained in the field. The dynamic approach has the potential to offer rapid definition of hot spots and an effective method for identifying when sufficient information has been collected to guide decisions that will be based on the characterization study. This is accomplished by concentrating the sampling frequency in areas observed to be contaminated at a level of concern while reducing the frequency of sampling in areas observed to be uncontaminated. If it is determined that the soil borings already completed in a given area have provided sufficient data, then other planned borings in that area may be eliminated or moved to a location where the boring might be expected to provide better information.

The Phase II Zone A sampling location is in areas with a history of known contamination or areas of possible contamination from spills or pipe seepage in the immediate vicinity of the tanks (Figure 4-1). Zone B sampling locations are in areas where possible contamination may have occurred from spills into the ditch that circled building 615 or pipe seepage related to piping and valve boxes outside the immediate area of the tanks. Zone C sampling locations are biased, based on the prevailing wind direction at the site. There is no history of known windblown contamination at the V-Tanks site.

4.1.2.1 Zone A. Zone A encompasses the currently defined AOC. Zone A sampling will include sampling soils by the 1981 spill area northwest of the TSF-09 tanks. Zone A sampling will:

- Provide data to determine if soil near the V-Tanks and the historical spill areas meet cleanup levels. Remediation goals for contamination other than Cs-137 will be established by back-calculating contaminant concentrations based on slope factors and hazard indexes for each contaminant of interest.
- Provide data to profile the soils identified for excavation and waste disposal.
- The sampling locations are shown in Figure 4-1 and are described as follows:
- Sampling location DS-01 (Zone A) is planned as deep sampling location in close proximity to the V-Tanks. DS-01 is the approximate location of the known spill into the ditch and therefore will be used to determine the depth of contamination from the spill, if any.
- A down-hole gamma count will be conducted, if feasible. If background radiation or other issues interfere with the down-hole gamma scans, then composite samples will be collected from the cores and a field portable high-purity germanium detector will be used to detect the presence of gamma and beta emitters.
- Deep sampling location DS-01 will be continuously cored from land surface to the top of basalt. Gamma-emitting radionuclides will be measured and recorded in the field for deep samples from the surface to 45 ft (top of basalt) to help determine the area of contamination related to the V-Tanks.

4.1.2.2 Zone B. Zone B sampling will extend about 50 ft to the north and south of Zone A. Zone B sampling includes soil borings at and around the old valve pit #2, TSF-21 (removed in 1993), and in the area of the old drainage ditch that surrounded building 615. Zone B sampling will include soils which may have been affected by spills, and soils that may have been affected by piping and valve pit leaks. Zone B sampling will occur in the sample locations shown in Figure 4-1.

- All borings in Zone B will be continuously cored, and cores handled in the same manner as in Zone A. A minimum of 4 soil borings (DS-02, and SS-01 through SS-03) are planned. DS-02 is the location to determine whether there is further contamination beneath the removed valve pit, TSF-21. SS-01 is the location to determine whether there is contamination due to runoff from the cask storage pad. SS-02 is in the location where the spill may have flowed beyond the ditch and culvert. If contamination exists at SS-02, then the ditch and culvert will be investigated further. SS-03 is the location to determine whether there is contamination radially north from the removed valve pit, TSF-21.
- Soil borings will be down-hole gamma scanned, or cores will be sampled and analyzed in the field for gamma emitters in the same manner as discussed for Zone A.
- Boring locations may be adjusted depending upon the results obtained from the first several borings completed and will be documented in the field on a field site sampling location map.
- Deep sampling location DS-02 will consist of measuring and recording gamma-emitting radionuclides on a continuous basis from the top of basalt to land surface. Composite samples (see Section 5.1) for laboratory analysis will be collected based on the results of the down-hole gamma scan.
- Shallow sampling locations, SS-01 through SS-03, will consist of continuous coring and soil sampling to a depth of approximately 10 ft.^d If Cs-137 is detected at 10 ft depth at activities greater than the risk-based criteria, then the boring should be continued until Cs-137 activity is less than the risk-based criteria or until the top of the basalt is reached. Composite soil samples will be collected from these cores and analyzed in the same manner as discussed in Section 5.1—only if field gamma analyses suggest that such sampling is necessary.

4.1.2.3 Zone C. Zone C sampling will extend north of the Zone B. Zone C sampling is primarily to evaluate whether contamination has migrated through windblown dispersion north of the WAG 1, OU 1-10 Area.

- Five locations (SS-04 through SS-08) are proposed in Zone C for continuous soil coring and sampling (see Figure 4-1).
- Shallow sampling locations, SS-04 through SS-08, will consist of continuous coring and soil sampling to a depth of approximately 10 ft (see footnote 3). If Cs-137 is detected at 10 ft depth at activities greater than the risk-based criteria, then the boring should be continued until Cs-137 activity is less than the risk-based criteria or until the top of the basalt is reached. Composite soil samples will be collected from these cores and analyzed in the same manner as discussed in Section 5.1—only if field gamma analyses suggests that such sampling is necessary.

4.1.3 Phase II Soil Sampling Analytical Requirements

Phase II sampling will consist of soil borings with continuous coring and composite soil samples collected for laboratory analyses. Phase II soil sampling will be based entirely on the results obtained from the gamma logging. Composite soil samples to be analyzed for Contract Laboratory Program (CLP)

d. Shallow sampling will be performed to a depth of 10 ft in order to account for clean fill that may have been brought into the area (possibly up to 4ft) and to be able to use the down-hole gamma logger (at least 3 ft below the clean fill).

metals, VOCs, SVOCs, PCBs, and radionuclides (see Table 4-1) will be collected from sections of the soil cores that exhibit Cs-137 activity both above and below the 23.3 pCi/g action level. The purpose of the CLP analyses is to determine the AOC and to verify that Cs-137 is in fact the only contaminant with a risk factor exceeding 1E-4. Composite soil samples to be analyzed for TCLP metals, VOCs, SVOCs, PCBs, herbicides, pesticides, reactive cyanide, fluoride, sulfide, and pH (see Table 4-1) will be collected only from sections of the soil cores that exhibit Cs-137 activity above the 23.3 pCi/g action level. Since all soils with Cs-137 activity greater than the action level will be excavated and disposed of, it is necessary to obtain TCLP data for the waste profiles for these soils. Approximately two to six sets of samples will be collected for TCLP analyses. Areas of soil contaminated with Cs-137 above the action level are most likely to be encountered in those soil borings in the immediate vicinity of the V-Tanks (Zone A).

Table 4-1. Required Contract Laboratory Program and toxicity characteristic leaching procedure analyses.

CLP (Required for determination of AOC) (Collect from sections of core containing Cs-137 both above and below the action level)	TCLP, pH, and reactivity (Required for hazardous waste determinations) (Collect from sections of core containing Cs-137 that exceed the action level)	Radionuclides (Required for determination of AOC) (Collect from sections of core containing Cs-137 both above and below action level)
Metals	Metals	Gamma spec
VOCs	VOCs	Rad Chemistry Suite #1
SVOCs	SVOCs	Iodine-129
PCBs	PCBs	Tritium
	Herbicides and Pesticides	
	Cyanide (reactive)	
	Fluoride	
	Sulfide	
	pH	

Phase II subsurface soil sample results will be used to further determine the nature and extent of contamination related to the V-Tanks; to provide data for a hazardous waste determination and waste profile for the soils in the vicinity of the V-Tanks; and to ensure that the soils meet waste acceptance criteria for disposal.

The SAP tables in Appendix A provide the intended sample quantities and analysis for sample type. Tables 2-1 and 2-2 of the QAPjP (DOE-ID 2002a) include identification of the container volumes, types, holding times, and preservative requirements that apply to all soil samples being collected under this FSP.

4.2 Quality Assurance/Quality Control Samples

In addition to primary project samples, QA/QC samples will be collected to establish quantitative and qualitative criteria necessary to support the intended regulatory action and describe the acceptability of the data by providing information comparable to and representative of actual field conditions.

As discussed in Section 3, QC samples consisting of field blanks and equipment rinsate blanks will be used to determine field accuracy. Field blanks and equipment rinsate blanks will be collected only for

those samples submitted to the laboratory for analysis. Quality control (duplicate) samples are used to measure field precision. Duplicate samples will be collected at an interval of one sample/media/day. Quality control duplicate samples will be collected by placing enough soil sample to fill both the primary and QC sample bottles into a stainless steel or aluminum pan, mixing the soil thoroughly, and then filling both sets of sample containers in an alternating fashion. The QA/QC sample results will be evaluated as outlined in the QAPjP (DOE-ID 2002a). Trip blanks will be included with all samples shipped for VOC analyses.

5. SAMPLING PROCEDURES

The following sections describe the planned sampling and analyses described in this FSP. Prior to commencement of soil sampling activities, a presampling meeting will be held to review the requirements of the FSP and HASP and ensure supporting documentation has been completed.

5.1 Sampling Requirements

Sampling activities will include field screening for organic and radiological contaminants for personnel health and safety purposes, in accordance with the project-specific HASP. Field screening for alpha and beta/gamma radiation will be performed. The HSO and RCT will determine the use of radiological screening instrumentation for health and safety purposes. Calibration of instruments will be performed in accordance with appropriate procedures and the QAPjP (DOE-ID 2002a). Radiological contaminants will be identified when screening indicates a reading of 100 counts per minute (cpm) above background levels.

All soil sampling procedures will be discussed each day in a presampling meeting. The meeting discussion will include, but will not be limited to, sampling activities for the day, responsibilities of team members, and safety issues. Separate meetings will be held to discuss sampling of unique and uncharacterized secondary waste streams.

Before soil sample collection is initiated, an equipment rinsate will be collected. As discussed in Section 10.1.2, the field team members will use the field guidance forms from the SAM to ensure the proper jars and preservatives are used for each analysis type. The anticipated equipment requirements are listed in Section 10.2, "Sample Equipment and Handling."

The following subsections describe the Phase I surface survey, Phase II soil sampling, and Phase II secondary waste sampling that will be performed by the sampling team to obtain the data needs delineated in this FSP and detailed in the project DQO workbook. Field deviations from the SAP table presented in Appendix A will be in accordance with MCP-233, "Environmental Restoration Document Control Center Interface."

5.1.1 Phase I Surface Surveys

The Phase I of the site investigation consists of a surface survey using a surface gamma scan. The surface gamma scan will be carried out using a lead collimated detector mounted on a tripod and/or with HumVee-mounted scintillators. Sample results will be logged in a field notebook.

5.1.2 Phase II Gamma Logging

All borings will be completed using hollow-stem augers (HSA) equipped with a continuous core-barrel system. When a boring has reached total depth, the core-barrel assembly will be removed from the inside of the hollow-stem augers. All cores will be sealed and stored in the core barrels in a refrigerated environment until the down-hole gamma logging for that particular boring has been completed. The augers will be left in place in the ground and the down-hole gamma logging tool will be run inside the HSA from the bottom up. If the down-hole logging tool fails to provide satisfactory results (because of background interference for example) then samples will be collected from the cores to be field-analyzed with the field portable high-purity germanium detector gamma spectrometer. Each core will be opened by splitting the core barrel liner lengthwise. All cores will be examined for visible indications of contamination and will be checked with a hand-held gamma detector as a routine matter. All observations shall be recorded in the logbook. All soil samples collected shall be composites obtained

from the entire 5 ft length of the core by collecting a minimum of 20 subsamples spaced evenly over the length of the core. Each subsample should be about 1/20th of the amount required for the gamma spec analysis.

5.1.3 Phase II Soil Sampling

After the down-hole gamma measurements in a given boring are completed and the data analyzed, the stored core for that boring will be opened by splitting the core barrel lengthwise. As a routine matter, all cores will be examined for visible indications of contamination, checked with hand-held gamma detectors for the presence of radionuclides, and checked with a photo or flame ionization detector for VOCs. All observations shall be recorded in the logbook. The core sections from which soil samples will be collected will be determined in the field by analyzing the results of the field gamma measurements. To minimize disturbance to the VOC soil samples, VOC soil samples will be collected as grab samples directly into the appropriate container. All other soil samples will be composited from as many feet of the soil core as required to obtain sufficient sample volume. It is expected that sufficient sample material will be collected from each five-foot core barrel. All soil samples collected shall be composites obtained from the entire 5-ft length of the core by collecting a minimum of 20 subsamples spaced evenly over the length of the core. Each subsample should be about 1/20th of the amount required for the required analyses. The soil subsamples should be placed in a clean stainless steel or aluminum pan, thoroughly mixed with a clean stainless steel spoon, and the sample containers filled in an alternating fashion. The core footage from which the composite soil sample is collected shall be recorded in the logbook. Soil sampling will follow the guidelines established in the QAQjP (DOE-ID 2002a).

Soil samples to be analyzed for CLP metals, VOCs, SVOCs, PCBs, and radionuclides will be collected from sections of cores where gamma measurements have indicated Cs-137 activities both above and below the action level (23.3 pCi/g). Soil samples to be analyzed for TCLP metals, TCLP VOCs, TCLP SVOCs, PCBs, TCLP herbicides, TCLP pesticides, reactive cyanide, fluoride, sulfide, pH, and radionuclides will be collected only from sections of cores where gamma measurements have indicated Cs-137 activities above the action level.

Quality control duplicate samples will be collected by placing enough soil sample to fill all of the required sample containers in a clean stainless steel or aluminum pan, thoroughly mixing the soil with a clean stainless steel spoon, and then filling the sample containers in an alternating fashion.

Equipment rinsate samples will be collected by pouring analyte-free water over the decontaminated sampling equipment and then into the appropriate sample containers. Field blanks will be collected by pouring analyte-free water into the appropriate 40 ml vials while actually in the area of interest.

5.1.4 Phase II Secondary Waste Sampling/Investigation Derived Waste Sampling (IDW)

Secondary waste sampling/IDW will be characterized primarily by process knowledge and historical data. Hazardous waste determinations must be made pursuant to the requirements set forth by Waste Generator Services (WGS) MCPs (MCP-62, MCP-63, MCP-69, and MCP-70), the *Idaho National Engineering Laboratory Reusable Property, Recyclable Materials, and Waste Acceptance Criteria (RRWAC)* (DOE-ID 2002c), and the *Waste Certification Plan for the Environmental Restoration Program* (INEEL 1997).

5.1.5 Field Decontamination

Field decontamination procedures will be designed to prevent cross-contamination between locations and samples and to prevent offsite contaminant migration. Equipment associated with the field

surveys and soil sampling will be thoroughly decontaminated prior to initial use and between sample locations. Rinsate QA samples will be collected 1 per 10 core-sampling assemblies. Following decontamination, sampling equipment will be wrapped in foil to prevent contamination from windblown dust. Wet wipes, brushes, and steam cleaners may be used for decontamination. Sample blanks are collected to demonstrate background levels and decontamination. The use of free liquids will be minimized.

5.1.6 Personal Protective Equipment

The PPE required for these sampling efforts is discussed in the project HASP and may include, but will not be limited to:

- Gloves
- Respirator cartridges
- Shoe covers
- Anti-contamination coveralls/clothes.

Prior to disposal, all PPE will be characterized based on soil sample and health and safety field screening results. A hazardous waste determination will be made pursuant to the requirements set forth by WGS MCPs (MCP-62, MCP-63, MCP-69, and MCP-70), the *Idaho National Engineering Laboratory Reusable Property, Recyclable Materials, and Waste Acceptance Criteria* (DOE-ID 2002c), and the *Waste Certification Plan for the Environmental Restoration Program* (INEEL 1997).

5.1.7 Shipping Screening

All samples collected from radiologically contaminated areas will be field screened for external contamination by the RCT prior to being released from the project work site. The RCT will determine if samples meet the release criteria, as documented in the radiological work permit. In accordance with DOT regulations and current company policies, a company-certified hazardous materials shipper will transfer all hazardous materials.

5.2 Handling and Disposition of Investigation-Derived Waste

All waste streams that are generated as a result of the sampling activities will be managed in accordance with the *Waste Management Plan for V-Tanks Early Remedial Action for the Test Area North, Waste Area Group 1, Operable Unit 1-10, Group 2 Sites* (INEEL 2003a). If a waste stream of decontamination water (which may include deionized water, soap, and small quantities of isopropanol) is generated, it will be collected, sampled, analyzed (see Appendix A, SAP Tables), and characterized for proper waste management. The volume of decontamination fluids produced will be minimized by using spray bottles to apply the fluids or by applying the fluid with wipes.

6. SAMPLING OBJECTIVES FOR IDENTIFYING CONTAMINATION AND WASTE PROFILING SOILS UNDER THE PIPING AT THE V-TANK SITES

The Intermediate-Level Radioactive Waste (ILRW) Feed Subsystem (TSF-09/18 and TSF-21) includes the collecting tanks (V-1, V-2, and V-3), the sump tank (V-9), a sand filter, a total of fourteen individual pipes that connect the tanks to TAN-616, and the surrounding contaminated soils (hereafter referred to as the V-Tank sites). For FY 2003, isolation of the sump tank (V-9), removal of the piping associated with the V-9 Tank outlet line, and determination of the area of contamination associated with the V-Tank site soils has been scheduled for ERA in support of RD/RA and closure activities that are to be conducted in the future.

6.1 Data Needs

Data needs have been determined through the evaluation of existing data and the projection of anticipated data requirements. The overall objective of this section of the FSP is to identify contamination and characterize observed potential spills and leaks under the piping at the V-Tank sites. The data will be used to characterize the contaminated soil and evaluate the extent of contamination as soils are remediated. A three-dimensional map, illustrating the data collected from these activities, will be created to document each location at which contaminated soil is observed. This map will be utilized for contaminated soil removal in 2006. In support of these activities, samples will be collected under varying conditions involving various media and subsequent analysis.

The DQO process has been used for these sampling activities and is described in Section 6.2. As qualitative and quantitative statements, the DQOs help to ensure that collected data are of sufficient quality and quantity to achieve the objectives established in this FSP.

The criteria for measurement data are expressed as quality assurance objectives (QAOs). The measurement QAOs are specifications that data must meet to comply with the project needs specified by the DQOs. The specific QA parameters of interest are defined as quantitative QA parameters (precision, accuracy, method detection limit [MDL], and completeness) and qualitative parameters (representativeness and comparability). The QAOs are described in Section 6.3.

This FSP is used in conjunction with the QAPjP (DOE-ID 2002a) to present the functional activities, organization, and QA/QC protocols necessary to achieve the specified DQOs. Together, the QAPjP and the FSP constitute the SAP for OU 1-10 V-Tank confirmation soil sampling activities.

6.2 Data Quality Objectives

In order to ensure that the data for this project are of sufficient quality and quantity to support defensible decisions, the process of collecting and analyzing data must be scientifically defensible. The sampling process is discussed in the context of DQOs, as defined by *Guidance for the Data Quality Objectives Process* (EPA 1994). The concept of DQOs was developed by the EPA to establish a process for defining the data needed to make defensible decisions involving the study, design, and cleanup of hazardous waste sites and to ensure that the type, quantity, and quality of data used in the decision-making are appropriate for the intended application. The goals of the DQO process are technical adequacy (technically sound deliverables), defensibility, consistency in approach and documentation, and cost effectiveness.

The DQO process includes seven steps. The seven-step DQO process is a highly structured, tactical approach to implementing the overall DQO process, and each of the seven steps has a specific output. The output from each step influences the choices that will be made later in the process. In order for the seven-step DQO process to be effective, steps must be performed in the proper order, inputs must be based on comprehensive scoping and maximum participation/contributions by decision makers, and sample design must be based on the severity of the consequences of decision error. Even though the DQO process is depicted as a linear sequence of steps, in practice it is iterative (i.e., the outputs from one step may lead to a reconsideration of prior steps). This iteration is encouraged since it will ultimately lead to a more efficient data collection design.

6.2.1 Problem Statement

The first step in the DQO process is to clearly and concisely state the problem to be addressed for the soils under the piping at the V-Tank sites. The concise problem statement describes the problem as it is currently understood, and the conditions that are causing the problem. Prior studies and existing information are reviewed to gain a sufficient understanding to define the problem. The appropriate outputs for this step are a concise description of the problem, a list of the planning team members, identification of the decision-maker(s), and a summary of available resources and relevant deadlines for the study. The planning team members and decision-makers are identified in Section 2. The ERAs are scheduled for the summer of 2003.

Some of the V-9 Tank-related piping will be excavated, isolated, capped, and removed as part of the D&D and VCO activities. The tank contents, and therefore the piping, are contaminated with radionuclides, heavy metals, organic compounds, and polychlorinated biphenyls (PCBs). Since releases at these sites may pose an imminent and substantial endangerment to human health and the environment, the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999) specifies that contaminated soils above regulatory limits will be removed. Therefore, the problem statements are:

- Releases or leaks may occur during the removal of the V-Tank piping, or soil contamination may be identified beneath the piping from releases or leaks that may have occurred prior to the removal of the piping. Therefore, samples may be required to characterize potentially contaminated soils (INEEL 2003b).
- Contaminated soils must be containerized and shipped to an appropriate disposal facility. Since waste profile information for any contaminated soils identified under the piping at the V-Tank sites must be provided to the intended disposal facility, sufficient samples of the contaminated soil are required to generate the waste profile. In addition, the contaminated soils must be characterized to ensure that they meet the waste acceptance criteria for subsequent waste dispositioning at the intended disposal facility.

6.2.2 Identification of Decisions

The primary objective of Step 2 in the DQO process is to develop an accurate and comprehensive decision statement (DS) that addresses the concerns highlighted in the problem statement. This includes identifying the questions that the study will attempt to resolve, and what actions may result or be affected by the data collected. This is done by specifying a principle study question (PSQ), identifying alternative actions (AAs) that could result from resolution of the PSQ, and combining the PSQ and AAs into a DS.

The PSQ pertaining to the problem statement is:

- PSQ: Did a release or leak occur during the removal of the V-Tank piping, or is any soil contamination detected or suspected beneath the V-Tank piping from releases or leaks that may have occurred prior to the removal of the V-Tank piping?

The AAs to be taken, depending on the resolution to the PSQ, are as follows:

- AA1a: If a release or leak occurred during the removal of the V-Tank piping, or if any soil contamination is detected or suspected beneath the V-Tank piping from releases or leaks that may have occurred prior to the removal of the V-Tank piping, samples of the potentially contaminated soil may be required to provide waste characterization information. This information would subsequently be used to provide a waste profile to the intended disposal facility.
- AA1b: If a release or leak did not occur during the removal of the V-Tank piping, or if soil contamination is not detected or suspected beneath the V-Tank piping, then no further action will be required with regard to the soils beneath the piping. In this case, waste profile information would not be required.

Combining the PSQ and AAs results in the following DS:

- DS: Determine if a release or leak occurred during the removal of the V-Tank piping, or if any soil contamination is detected or suspected beneath the V-Tank piping from releases or leaks that may have occurred prior to the removal of the V-Tank piping. In addition, determine if further characterization and/or waste profile information is required.

6.2.3 Identification of Inputs to Decisions

Decision inputs are the parameters required to resolve the DS and determine if the decision requires environmental measurements. The information needed to resolve the DS listed above is the identification of all potential contaminants of concern associated with the waste material within each of the V-Tanks and associated piping. Existing data for the concentrations of hazardous constituents present in the waste contained in the collecting tanks (V-1, V-2, and V-3) and the sump tank (V-9) are relevant to this study because they provide the minimum list of constituents for which analyses should be performed. The existing data cannot be used to determine if a release has occurred, as this data was collected to characterize the material within the tank system. Another source of information comes from historical process knowledge of tank operations. This information further defines the list of constituents for which analysis data are required.

During this step of the DQO process, the basis for an action level is established. The action level is the threshold value that provides the criterion for choosing between AAs. Action levels may be based on regulatory thresholds or standards, or they may be derived from problem-specific considerations such as risk analysis.

Biased samples will be collected in accordance with the sampling design given in Section 7, and will be analyzed for the constituents specified in Section 7. Cs-137 at levels in excess of the FRG (23.3 pCi/g) will be an initial indicator of the presence or absence of contamination. Table 4-1 provides information for the required CLP, TCLP, and radionuclide analyses. Any detected analytes will be compared to their regulatory limits to determine whether or not contamination is present beneath the V-Tank piping.

6.2.4 Definition of Study Boundaries

During Step 4, the spatial and temporal boundaries to which decisions will apply in order to clarify the sample domain are defined. The spatial boundaries simply define the physical extent of the study area and may be subdivided into specific areas of interest. The temporal boundaries define the duration of the study or specific parts of the study. The outputs of this step are a detailed description of the spatial and temporal boundaries of the problem and a discussion of any practical constraints that may interfere with the study.

For the soils under the piping at the V-Tank sites, the spatial boundaries include the soil area above which the V-Tank piping currently exists and/or previously existed at the V-Tank site, as shown in Figure 4-1. The characteristics that define the population of interest are the concentration of contaminants that will be determined from the analyses described in Table 4-1 in the area identified.

6.2.5 Development of Decision Rules

Step 5 combines Steps 1 through 4 to produce four elements to form decision rules: the statistical parameter of interest, scale of decision-making, action level, and AAs. It integrates the previous DQO outputs into a single statement that describes the logical basis for choosing among AAs.

The decision rule is an “if . . . then . . .” statement, describing the action to take if one or more conditions are met that combines the parameter of interest, the scale of decision-making, the action level, and the action(s) that would result from resolution of the decision.

The decision rules associated with the piping at the V-Tank sites are:

- **If** a release or leak occurred during the removal of the V-Tank piping, or if any soil contamination is detected or suspected beneath the V-Tank piping from releases or leaks that may have occurred prior to the removal of the V-Tank piping, **then** samples of the potentially contaminated soil may be required to provide waste characterization information. This information would subsequently be used to provide a waste profile to the intended disposal facility.
- **If** a release or leak did not occur during the removal of the V-Tank piping, or if soil contamination is not detected or suspected beneath the V-Tank piping, **then** no further action will be required with regard to the soils beneath the piping. In this case, waste profile information would not be required.

6.2.6 Specification of Limits on Decision Errors

Since analytical data can only provide an estimate of the true condition of a site, decisions that are based on such data potentially could be in error. The purpose of Step 6 is to minimize uncertainty in the data by defining tolerable limits on decision errors that are used to establish performance goals for the data collection design.

The decision-maker must define acceptable limits on the probability of making a decision error. The possibility of decision error cannot be eliminated, but it can be minimized by controlling the total study error. Methods for controlling total study error include collecting a sufficient number of samples (to control sampling design error), analyzing individual samples several times, or using more precise analytical methods (to control measurement error). Therefore, it is necessary to determine the possible range for the parameter of interest and to define both the types of decision errors and the potential consequences of the errors.

The two types of decision errors that could occur with regard to the soils under the piping at the V-Tank sites are:

- Determining that a release or leak did not occur during the removal of the V-Tank piping, or that soil contamination is not present beneath the V-Tank piping (when in fact contamination is present) would result in the assumption that the soils under and immediately surrounding the piping at the V-Tank sites are not contaminated and do not require further remediation. This may result in CERCLA compliance issues and failure to protect human health and the environment.
- Determining that a release or leak occurred during the removal of the V-Tank piping, or that soil contamination is present beneath the V-Tank piping (when in fact contamination is not present) would result in collection of unnecessary additional samples to characterize the release, resulting in further expense of project resources to complete the unnecessary activities and the potential for the generation of unnecessary waste in the form of unnecessary soil removal activities.

Because biased sampling will be conducted at this site, statistically based decision error limits (Type 1 and Type 2) are not appropriate. Instead, for the biased sampling, uncertainty will be reduced by using instrumentation to determine areas of highest contamination, and these locations will be sampled. The sampling design is discussed further in Section 7.

6.2.7 Optimization of Investigation Design for Obtaining Data

The purpose of design optimization in the DQO process is to evaluate information from the previous steps, generate alternative data collection design options that will provide the data needed for the desired analysis, and select the most resource-effective design that meets all DQOs. The activities involved in design optimization include:

- Reviewing the outputs of the first six steps and existing environmental data
- Developing general data collection design alternatives
- Formulating a mathematical expression needed to solve the design problem for each data collection design alternative
- Selecting the optimal number of samples to satisfy the DQOs for each data collection design alternative
- Selecting the most resource-effective data collection design that satisfies all the DQOs.

After these activities are completed, the operational details and theoretical assumptions of the selected design are documented in the FSP. Several designs were considered during the development of this plan. The details proposed in Section 7 are the designs projected to meet project resource availability while satisfying the DQOs.

6.3 Quality Assurance Objective for Measurement

The QA objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2002a), which provides minimum requirements for the following measurement quality indicators:

- Precision

- Accuracy
- Representativeness
- Completeness
- Comparability.

Precision, accuracy, and completeness will be calculated in accordance with the QAPjP. Representativeness and comparability will be promoted by the sampling design, the collection of samples using similar sampling techniques to previous efforts, and the use of the same analytical techniques as previous efforts. By promoting representativeness and comparability in this manner, the previous data set can be supplemented with the new data collected under implementation of this FSP.

Spatial variations are present in concentrations of contaminants at a site, creating sampling variability. Additional variability occurs during sample collection, handling, processing, analysis, quality evaluation, and reporting. While the variability associated with sampling cannot be eliminated, it can be minimized by using the DQOs, as given in Section 6.2, and obtaining QA samples, such as duplicate samples, field blanks, and rinsate samples. To ensure that data collected are sufficiently accurate and consistent with the DQOs, the following parameters will be used for assessing the quality of the measurement data.

6.3.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. It is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, and expressed generally in terms of standard deviation. In the field, precision is affected by the natural heterogeneity of the material being sampled and by sample collection procedures.

Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision is typically required for chemicals with very low action levels that are close to background concentrations.

Laboratory precision requirements are part of the validation criteria against which laboratory data are evaluated. Laboratory precision is estimated through the use of duplicates, spiked samples (i.e., matrix and/or surrogate spikes), and/or laboratory control samples (LCSs). Laboratory precision will be evaluated during the method data validation process. The number of laboratory QC samples is specified in the analytical methods used and in the SAM SOW (or task order SOWs). Evaluation criteria for the QC samples are specified in the SAM data validation technical procedures (TPRs).

Field precision will be based upon analysis of co-located field duplicate or split samples. For samples collected for laboratory analyses, a field duplicate will be collected at a minimum frequency of one sample/media/day. Duplicate samples will be collected, assigned a separate sample number, and submitted blind to the laboratory. Duplicate samples will be collected in accordance with Section 7.1 of this FSP. Duplicate sample locations are indicated in the SAP tables in Appendix A.

6.3.2 Accuracy

Accuracy is a measure of bias in a measurement system. It is the closeness of agreement between the measured value and the true value and is calculated as %R. Sample preservation and handling, field

contamination, and the sample matrix in the field affect overall accuracy. The effects of these three parameters can be assessed by evaluating the results of field blanks and equipment rinsates (i.e., equipment blanks). Field blanks are collected and analyzed to determine the level of contamination, if any, introduced into the sample during field sampling activities. They consist of the same water used for equipment decontamination. A rinsate is a sample of analyte-free water poured over decontaminated sampling equipment and is designed to detect any residual contamination on the equipment.

Laboratory accuracy requirements are part of the validation criteria against which laboratory data are evaluated. Laboratory accuracy is assessed through the use of matrix spikes, laboratory control samples, and blind QC samples, and will be evaluated during the method data validation process. The number of laboratory QC samples is specified in the analytical methods used and in the SAM SOW (or task order SOW). Evaluation criteria for the laboratory QC samples are specified in the SAM data validation TPRs.

Field accuracy will be determined for samples collected for laboratory analysis. The requirement for collecting field and equipment blank samples is a frequency of one for every 10 environmental samples or a minimum of one each day, whichever is less. In addition, the requirement for equipment rinsate samples states that equipment rinsates will be collected whenever there is a change in the sample collection procedures, sample decontamination procedures, sampling equipment, or sample collection personnel. Duplicate samples will be collected in accordance with Section 7.1 of this FSP. Duplicate sample locations are indicated in the SAP tables in Appendix A. The equipment rinsate samples will be collected (at a minimum) at the initiation of sampling at the V-Tank sites and at the conclusion of sampling at the V-Tank sites. The number of field and equipment blank samples is subject to change based on the field conditions and sampling efficiency.

6.3.3 Representativeness

The objective of representativeness is to assess whether information obtained during the investigation accurately represents actual site conditions. Representativeness is a qualitative parameter that expresses the degree to which the sampling and analytical data accurately and precisely reflect the characteristic of a population, the parameter variations at a sampling point, or an environmental condition (EPA 1987). Representativeness addresses the proper design of the sampling program implemented by the FSP. This criterion is satisfied by confirming that sampling locations are selected properly, a sufficient number of samples are collected, and an appropriate sampling technique is employed to meet the confidence level required by the intended use of the data. Variations at a sampling point will be evaluated based on the results of field duplicates.

For the purposes of the V-Tank sites sampling, good representativeness will be achieved through careful, informed selection of sampling sites and analytical parameters, through collection of a sufficient number of samples to assess the confidence level of the data with respect to its intended use, and through the proper collection and handling of samples to avoid interferences and to minimize contamination and loss. Section 6.2 of the FSP describes the DQOs used to select sample locations and number of samples.

6.3.4 Completeness

Completeness is a measure of the quantity of valid data collected during an investigation compared to the amount expected to be obtained under correct, normal conditions. It is a quantitative evaluation of what percent of the chemical measurements meet the project DQOs. The QAPjP (DOE-ID 2002a) requires that an overall completeness goal of 90% be achieved during a RI/FS. For all samples required for this FSP, a completeness goal of 90% is specified.

Successful analyses are defined as those where the samples arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and are accompanied by a completed chain of custody. Furthermore, the sample must be analyzed within the specified holding time and in such a manner that analytical QA/QC described in this document is met.

Completeness for the entire project also involves completeness of field and laboratory documentation, whether all samples and analyses specified in this FSP have been processed, and the procedures specified in the FSP have been implemented.

6.3.5 Comparability

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. It defines the extent to which a chemical parameter measurement is consistent with, and may be compared to, values from other sampling events. At a minimum, comparable data must be obtained using unbiased sample designs. If sampling designs are not unbiased, the reasons for selecting another design should be well documented. For this portion of the project, the rationale for the sampling design is presented in Section 7.

Comparability among field measurements will be achieved through the use of standard procedures, standard field data sheets, and uniform concentration units. To ensure comparability, field procedures will be standardized and field operations will adhere to MCPs and TPRs. Laboratory data comparability will be ensured by the use of established and approved analytical methods, consistency in the basis of analysis (e.g., wet weight and volume), and consistency in reporting units. Analysis of standard reference materials will follow EPA or other standard analytical methods that utilize standard units of measurement, methods of analysis, and reporting format.

Although no data have previously been collected from soil beneath the V-Tanks, data have been collected from areas in the immediate vicinity of the V-Tanks. Therefore, data collected under this sampling plan may be compared to historical data sets to verify radionuclide activity associated with the contents.

6.3.6 Sensitivity

Assuring the validity of quantitative measurements at low concentrations is an extremely difficult technical problem. With regulatory action levels being pushed lower and lower, the validity of any given measurement becomes even more important. The consequences of false positive or false negative data can be significant. The laboratory will report results below the reporting limit as “Not Detected” because, by definition, the reliability of the data at that level is questionable. Organic data that need to be reported below the quantitation limit will have the data flagged accordingly.

Quantitation limits are the extent to which the equipment, laboratory or field, or analytical process can provide accurate, minimum data measurements of a reliable quality for specific constituents in replicate field samples. It is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The actual quantitation limit for a given analysis will vary depending on instrument sensitivity and matrix effects.

If dilution is required to bring the reported concentration of a single compound of interest within the linear range of the calibration, and the dilution results in nondetect values for all other analytes with detected concentrations in the initial sample analysis, the results of the original run and the dilution will be reported with appropriate notations in the narrative of the report. Matrix effects (i.e., highly contaminated samples requiring dilution for analysis, dilution to bring detected levels within the range of

calibration, and matrix interference requiring elevation of detection limits) will be considered in assessing compliance with the requirements for sensitivity.

Several detection levels are utilized in environmental laboratories, such as method detection limits (MDLs), instrument detection levels (IDLs), practical quantitation limits (PQL), and contract-required quantitation limit (CRQL). Generally, the detection level is the smallest amount that can be detected above the instrument noise in a procedure and within a stated confidence level.

The MDL is an empirically derived value used to estimate the lowest concentration a method can detect in a matrix-free environment. SW-846 defines the MDL as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL is determined from the analysis of replicate samples of a given matrix, containing analytes, which have been processed through the preparation or extraction procedure. The guidance in 40 CFR 136, Appendix B, is used to produce MDLs. Method detection limits are updated by the laboratory annually at a minimum and after significant instrument maintenance.

The PQL is the lowest concentration that can be reliably achieved within limits of precision and accuracy during routine operating conditions. The PQLs for reagent water are generally 3 to 5 times the MDL, but may be less, or more, based on the performance of the method for a particular analyte. Sample PQLs are highly matrix dependent. The PQLs provided in SW-846 are for guidance and may not always be achievable.

The CRQL is the PQL after review and approval by regulators (i.e., when the PQL becomes part of a contract).

Method blanks are reported to the MDL and samples are reported to the PQL.

6.4 Data Validation

Data validation is the process of data assessment in accordance with EPA regional or national functional guidelines or project-specific guidelines.

Accurate data reduction, validation, and reporting protocols are necessary to interpret data and arrive at decisions. The quality of the data collection process will be assessed through reviews of all measurements performed. The purpose of this section is to discuss the evaluation and assessment of QA/QC requirements necessary to document the quality of the collected data. The frequency of data review validation and verification is discussed below according to the category of data collected.

Data will be acquired, processed, and controlled prior to input to IEDMS under PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment." For samples submitted to the analytical laboratory for the work acceptance criteria compliance, the definitive data collected will be validated to Level B. Data validation will be performed in accordance with QAQjP (DOE-ID 2002a).

The SAM will validate the data to the levels of analytical method data validation. The analytical method data validation will be conducted in accordance with TPR-80, "Radiological Data Validation" (formerly Standard Operating Procedure 12.1.2). Validated data are entered into the IEDMS and uploaded to the data warehouse.

7. PIPE RUN SAMPLING LOCATION AND FREQUENCY

7.1 Quality Assurance/Quality Control Samples

In addition to primary project samples, QA/QC samples will be collected to establish quantitative and qualitative criteria necessary to support the intended regulatory action and describe the acceptability of the data by providing information comparable to and representative of actual field conditions.

As discussed in Section 6, QC samples consisting of field blanks and equipment rinsate blanks will be used to determine field accuracy. Field blanks and equipment rinsate blanks will be collected only for those samples submitted to the laboratory for analysis. Quality control (duplicate) samples are used to measure field precision. Duplicate samples will be collected at an interval of one sample/media/day. Quality control duplicate samples will be collected by placing enough soil sample to fill both the primary and QC sample bottles into a stainless steel or aluminum pan, mixing the soil thoroughly, and then filling both sets of sample containers in an alternating fashion. The QA/QC sample results will be evaluated as outlined in the QAPjP (DOE-ID 2002a).

7.2 Pipe Run Sampling Locations

The following sections describe the intended sampling locations, including the rationale for location selection and the analytical methods necessary to meet the data needs discussed in Section 6.1. The SAP tables in Appendix A provide the intended sample quantities and analyses for sample type. Tables 2-1 and 2-2 in the QAPjP (DOE-ID 2002a) identify the container volumes, types, holding times, and preservative requirements that apply to all soil and liquid samples collected under this FSP.

Sampling is required to confirm that the remediation goals and, hence, the remedial action objectives, have been achieved. The goal of the soil sampling to be conducted beneath the pipe runs is to provide data for the hazardous waste determination and the waste profile for the excavated soils to ensure that the soils meet waste acceptance criteria for disposal. Since the waste associated with the V-Tanks previously has been preliminarily determined to be characteristic and listed hazardous waste, it is necessary to identify the underlying hazardous constituents (UHCs) in order to meet the LDRs.

7.2.1 Pipe Run Soil Sampling

For soils beneath the V-Tank piping runs, sampling will be carried out based on visible soil staining. Any areas of visible staining, obvious and unusual moisture, or where the hand-held gamma detector indicates gamma radiation above background levels, will be selectively sampled and field analyzed with a gamma spectrometer. A field portable high-purity germanium detector will be used and calibrated to detect the presence of Cs-137. Proposed sample locations are where spills or leaks may have occurred. Since the extent and locations of the pipe runs may not be completely known, all sample locations will be determined in the field after the pipe runs have been excavated and removed. All sample locations will be flagged and surveyed after sample collection.

8. PIPE RUN SOIL SAMPLING PROCEDURES

The following sections describe the planned sampling and analyses discussed in this FSP. Prior to commencement of soil sampling activities, a presampling meeting will be held to review the requirements of the FSP and HASP and ensure that supporting documentation has been completed.

8.1 Pipe Run Soil Sampling Requirements

Sampling activities will include field screening for organic and radiological contaminants for personnel health and safety purposes in accordance with the project-specific HASP. Field screening for alpha and beta/gamma radiation will be performed. The HSO and RCT will determine the use of radiological screening instrumentation for health and safety purposes. Calibration of instruments will be performed in accordance with appropriate procedures and the QAPjP (DOE-ID 2002a). Radiological contaminants will be identified when screening indicates a reading of 100 counts per minute (cpm) above background levels.

All soil sampling procedures will be discussed each day in a presampling meeting. The meeting discussion will include, but will not be limited to, sampling activities for the day, responsibilities of team members, and safety issues. Separate meetings will be held to discuss sampling of unique and uncharacterized secondary waste streams.

Before soil sample collection is initiated, an equipment rinsate will be collected. As discussed in Section 10.1.2, the field team members will use the field guidance forms from the SAM to ensure the proper jars and preservatives are used for each analysis type. The anticipated equipment needs are listed in Section 10.2, "Sample Equipment and Handling."

Soil samples will be collected by placing the soil in the appropriate sample container using a decontaminated stainless steel scoop or spoon, or by hand driving a stainless steel or brass sleeve into the soil. Since previous investigations have preliminarily determined the wastes associated with the V-Tanks to be characteristic and listed hazardous waste, the soil samples will be analyzed for:

- radionuclides
- CLP and TCLP VOCs, SVOCs, PCBs, and metals
- TCLP herbicides and pesticides
- reactive cyanide, fluoride, and sulfide
- pH.

<p>NOTE: See Table 4-1 to determine radionuclide content, the presence of waste codes other than F001, and UHCs.</p>

The SAP tables in Appendix A provide the intended sample quantities and analyses for each sample. Tables 2-1 and 2-2 of the QAPjP (DOE-ID 2002a) include identification of the container volumes, types, holding times, and preservative requirements that apply to all soil samples being collected under this FSP.

8.2 Handling and Disposition of Investigation-Derived Waste

All waste streams that are generated as a result of the sampling activities will be managed in accordance with the *Waste Management Plan for V-Tanks Early Remedial Action for the Test Area North, Waste Area Group 1, Operable Unit 1-10, Group 2 Sites* (INEEL 2003a). If a waste stream of decontamination water (which may include deionized water, soap, and small quantities of isopropanol) is generated, it will be collected, sampled, analyzed (see Appendix A, SAP Tables), and characterized for proper waste management. The volume of decontamination fluids produced will be minimized by using spray bottles to apply the fluids or by applying the fluid with wipes.

9. SAMPLING DESIGNATION

Samples will be identified with a unique code and arranged in a SAP table and database.

9.1 Sample Identification Code

A unique character identification code made up of 10 characters will be used to identify all samples. Uniqueness is required to prevent the same identification code from being assigned to more than one sample and for maintaining consistency.

The first character of the code, 1, means the sample originated from WAG 1. The second and third characters, ER, mean that the sample was collected in support of ERA. The next three characters will be unique identifiers assigned by the INEEL SAM. Next, a two-character set (e.g., 01, 02) will be used to designate field duplicate samples. The last two characters will refer to a particular analysis and bottle type.

For example, a sample collected in support of the soil sampling activities might be designated as 1ER20101R4, where (from left to right):

- 1 designates the sample as originating from WAG 1
- ER designates the sample as being collected for ERA
- 201 is an INEEL SAM-generated unique identifier
- 01 designates the type of sample (01 = original, 02 = field duplicate)
- R4 designates gamma spectrometric analysis.

The IEDMS database will be used to record all pertinent information associated with each sample identification code. Preparation of the plan database and completion of the SAM request for services are used to initiate the sample and sample waste tracking activities performed by the SAM.

9.2 Sampling and Analysis Plan Table/Database

9.2.1 General

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following sections describe the information recorded in the SAP tables presented in Appendix A.

9.2.2 Sample Description Fields

The sample description fields contain information relating to individual sample characteristics.

9.2.2.1 Sample Identifier. The sampling activity field contains the first six characters of the assigned sample number. The entire sample number will be used to link information from other sources (field data, analytical data) to the information in the SAP tables for data reporting, sample tracking, and completeness reporting. The analytical laboratory will also use the sample number to track and report analytical results.

9.2.2.2 Sample Type. Data in this field will be selected from the following:

- **REG** for a regular sample
- **QC** for a quality control sample.

9.2.2.3 Media. Data in this field will be **SOIL** for soil samples, **SLUDGE** for sludge samples, **LIQUID** for V-Tank liquid samples, and **WATER** for applicable QA/QC samples.

9.2.2.4 Collection Type. Data in this field will be selected from the following:

- **GRAB** for grab
- **COMP** for composite
- **FBLK** for field blanks
- **RNST** for rinsates
- **DUP** for duplicate samples.

9.2.2.5 Planned Date. The planned sample collection start date has not been determined at this time.

9.2.3 Sample Location Fields

The sample location fields group pinpoints the exact location for the sample in three-dimensional space, starting with the general AREA, narrowing the focus to an exact location geographically, and then specifying the DEPTH in the depth field.

9.2.3.1 Area. The AREA field identifies the general WAG (in this case, TAN) sample-collection area. The AREA field will contain the standard identifier from the INEEL area being sampled. For this project, the AREA field will say TAN, for Test Area North.

9.2.3.2 Location. The LOCATION field will contain the grid identifier, if applicable. Data in this field will normally be subordinate to the AREA. This information is included on the labels generated by the SAM to aid sampling personnel.

9.2.3.3 Type of Location. The TYPE OF LOCATION field will provide descriptive information concerning the exact sample location.

9.2.3.4 Depth. The DEPTH of a sample location will correspond to the depth of the collected soil sample.

9.2.3.5 Matrix/Media. The matrix for a sample will be entered as “soil,” “sludge,” “liquid,” or “water” based on the sample.

9.2.4 Analysis Type

The ANALYSIS TYPE fields indicate analytical types (i.e., radiological or chemical). Space is provided at the bottom of the form to clearly identify each type. A standard abbreviation should also be provided, if possible.

10. DOCUMENTATION MANAGEMENT AND SAMPLE CONTROL

Section 10.1 summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures, photographic documentation, chain-of-custody forms, and sample container labels. Section 10.2 outlines the sample handling and discusses chain-of-custody, radiological screening, and sample packaging for shipment to the analytical laboratories.

10.1 Documentation

The FTL will be responsible for controlling and maintaining all field documents and records, and for ensuring that all required documents are submitted to the ER Administrative Record and Document Control offices at the conclusion of the project. Recordkeeping will be conducted in accordance with MCP-557, “Managing Records.”

Sample documentation, shipping, and custody procedures for this project are based on EPA-recommended procedures that emphasize careful documentation of sample collection and sample transfer. The appropriate information pertaining to each sample will be recorded in accordance with MCP-1194, “Logbook Practices for ER and Deactivation, Decontamination, and Decommissioning Projects;” and the QAPjP (DOE-ID 2002a). All personnel involved with handling, managing, or disposing of samples will be trained in accordance to PRD-5030, “Environmental Requirements for Facilities, Processes, Materials, and Equipment.” All samples will be disposed of accordingly.

A document action request (DAR) is required when field conditions dictate making any change (i.e., requiring additional analyses to meet appropriate waste acceptance criteria) to this FSP, the project HASP, or project procedures. If necessary, a DAR will be executed in accordance with MCP-233, “Environmental Restoration Document Control Center Interface.”

All information recorded on project documentation will be made in permanent ink. All errors will be corrected by drawing a single line through the error and entering the correct information, and all corrections will be initialed and dated. In addition, photographs will be taken to document field-sampling activities.

10.1.1 Sample Container Labels

Waterproof, gummed labels generated from the IEDMS database will display information such as the sample identification number, the name of the project, sample location, depth, and requested analysis type. In the field, label information will be completed and placed on the containers before the samples are collected. Information concerning sample date, time, the preservative used, field measurements of hazards, and the sampler’s initials will be recorded during field sampling.

10.1.2 Field Guidance Forms

Field guidance forms, provided for each sample location, will be generated from the IEDMS database to ensure unique sample numbers. These forms are used to facilitate sample container documentation and organization of field activities and contain information regarding the following:

- Media
- Aliquot identification
- Analysis type
- Container size and type
- Sample preservation methods.

In accordance with the Administrative Records and Document Control format, field logbooks will be used to record information necessary to interpret the analytical data. All field logbooks will be controlled and managed according to MCP-1194. The FTL, or designee, will ensure by periodic inspection that the field logbooks are being maintained in accordance with this MCP. The field logbooks will be submitted to the project files at the completion of field activities.

10.1.2.1 Sample Logbooks. The field teams will use the sample logbooks. Each sample logbook will contain information such as:

- Physical measurements (if applicable)
- All QA/QC samples
- Shipping information (e.g., collection dates, shipping dates, cooler identification number, destination, chain-of-custody number, and name of shipper).

10.1.2.2 FTLs Daily Logbook. A project logbook maintained by the FTL will contain a daily summary of:

- All the team activities
- Problems encountered
- Visitors
- A list of work site contacts.

This logbook will be signed and dated by the FTL or designee at the end of each day's sampling activities.

10.1.2.3 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment requiring periodic calibration or standardization. This logbook will contain logsheets to record the date, time, method of calibration, and instrument identification number.

10.2 Sample Equipment and Handling

Analytical samples for laboratory analyses will be collected in precleaned bottles and packaged according to American Society for Testing and Materials or EPA-recommended procedures. The QA/QC samples will be included to satisfy the QA/QC requirements for the field operation, as outlined in the QAPjP (DOE-ID 2002a). Qualified (SAM-approved) analytical and testing laboratories will analyze these samples. All samples will be radiologically screened prior to shipment as directed by RadCon.

10.2.1 Sample Equipment

Included below is a tentative list of equipment and supplies. This list is as extensive as possible, but not exhaustive, and should only be used as a guide. Other equipment and supplies specified in the project-specific HASP and revised TPRs are not included in this section. Field sampling and decontamination equipment may include:

- Tape measure (30.5 m [100 ft])
- Stainless steel or aluminum pans
- Stainless steel sampling spoons
- Manual soil auger
- Hand-held power soil auger
- Drilling rig capable of installing 4.25 in. ID hollow stem augers to a depth of at least 60 ft
- Central mine equipment (CME) (or equivalent) continuous soil coring system for hollow stem augers
- Plastic core barrel liners
- High Purity Germanium detector
- Down-hole gamma analyzer
- Coolers
- Blue Ice
- Paper wipes
- Plastic garbage bags
- Deionized water (20 L [5.3 gal] minimum)
- Nonphosphate-based soap
- Isopropanol
- Spray bottles
- Aluminum foil
- Pipe wrench
- Crescent wrench
- Hammer

- Tables
- Certified ultra-pure water (5-L [1.3 gal] JT Baker)
- Sample and shipping logbook
- FTL logbook
- Controlled copies of the FSP, QAPjP, HASP, and applicable referenced procedures
- Black-ink pens
- Black ultra-fine markers
- Sample containers, as specified in the QAPjP
- Preprinted sample labels and field guidance forms
- Nitrile or latex gloves
- Leather work gloves
- Resealable plastic bags (such as Ziploc®)
- Custody seals.

Sample preparation and shipping supplies may include:

- Pipettes
- pH paper
- Nitrile or latex gloves
- Paper wipes
- Parafilm
- Clear tape
- Permanent ink markers
- Strapping tape
- Resealable plastic bags, various sizes (such as Ziploc®)
- Chain-of-custody forms
- Shipping request forms

- Names, addresses, telephone numbers, and contact names for analytical laboratories
- Task order SOWs for analytical laboratories and associated purchase order numbers
- Vermiculite or bubble-wrap (packaging material)
- Plastic garbage bags
- Blue Ice
- Coolers
- “This side up” and “Fragile” labels
- Address labels
- Sample bottles and lids
- Custody seals.

10.2.2 Sample Containers

Tables 2-1 and 2-2 in the QAPjP (DOE-ID 2002a) identify the container volumes, types, holding times, and preservative requirements that apply to all solid and liquid samples being collected under this FSP. All containers will be precleaned (usually certified by the manufacturer) with the appropriate EPA-recommended cleaning protocols for the bottle type and sample analyses. Extra containers will be available in case of breakage, contamination, or collection of additional samples. Prior to use, preprinted labels with the name of the project, sample identification number, location, depth, and requested analysis will be affixed to the sample containers.

10.2.3 Sample Preservation

Liquid samples will be preserved in a manner consistent with the QAPjP (DOE-ID 2002a). If cooling is required for preservation, the temperature will be checked periodically before shipment to certify adequate preservation for those samples requiring temperatures at 4°C (39°F) for preservation. Ice chests (coolers) containing frozen reusable ice will be used to chill samples in the field after collection, if required.

10.2.4 Chain-of-Custody Procedures

The chain-of-custody procedures will be followed per PRD-5030 and the QAPjP (DOE-ID 2002a). Sample bottles will be stored in a secured area accessible only to the field team members.

10.2.5 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the DOT (49 CFR, Parts 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 262). All samples will be packaged in accordance with the requirements set forth in PRD-5030.

10.2.5.1 Custody Seals. Custody seals will be placed on all shipping containers to ensure that tampering or unauthorized opening will not compromise sample integrity. The seal will be attached in such a way that opening the container requires that the seal be broken. Clear plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment. Seals will be affixed to containers before the samples leave the custody of the sampling personnel.

10.2.5.2 Onsite and Offsite Shipping. An on-Site shipment is any transfer of material within the perimeter of the INEEL. Work site-specific requirements for transporting samples within work site boundaries, in addition to those required by the shipping/receiving department, will be followed. Shipment within the INEEL boundaries will conform to DOT requirements, as stated in 49 CFR. Any off-Site sample shipment will be coordinated with INEEL Packaging and Transportation personnel, as necessary, and will conform to all applicable DOT requirements.

10.3 Documentation Revision Requests

Revisions to this document will follow MCP-233, “Environmental Restoration Document Control Center Interface.”

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